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ANNOTATED BIBLIOGRAPHY ON U.S.S.R. GRAVIMETRY

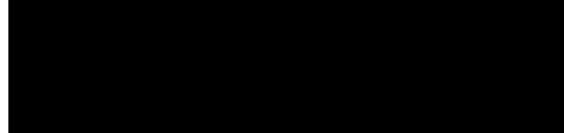
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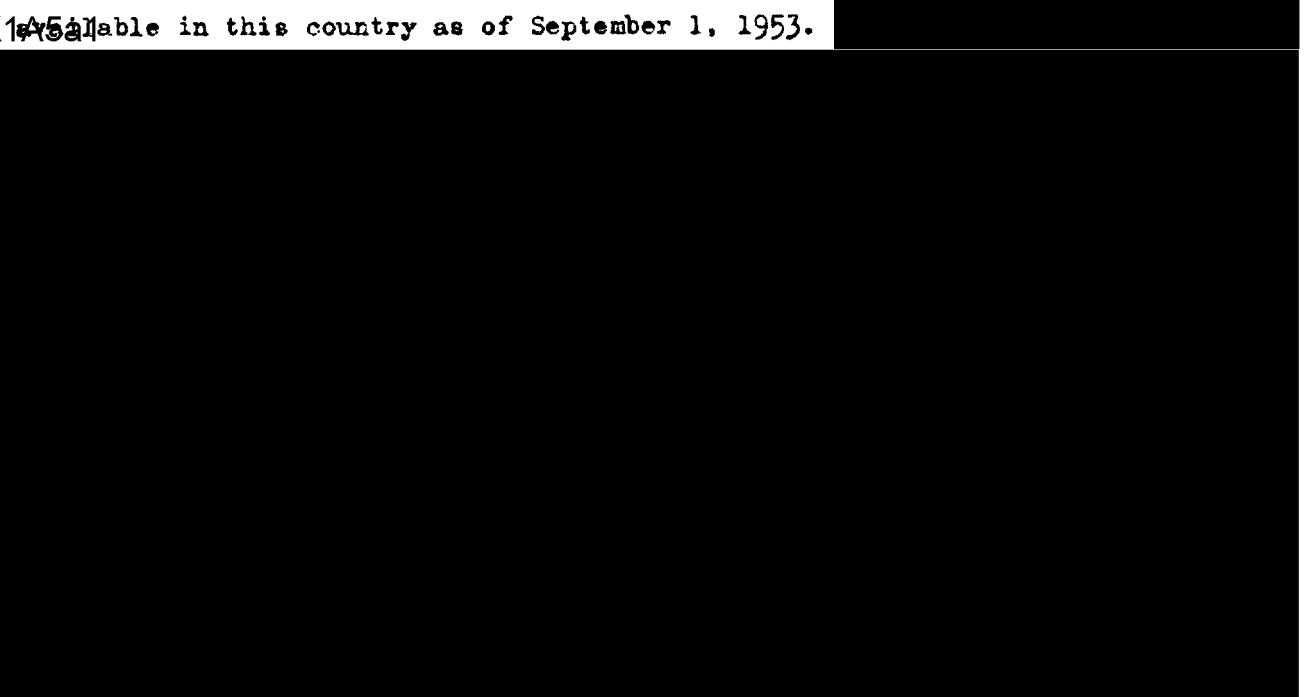
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PART I

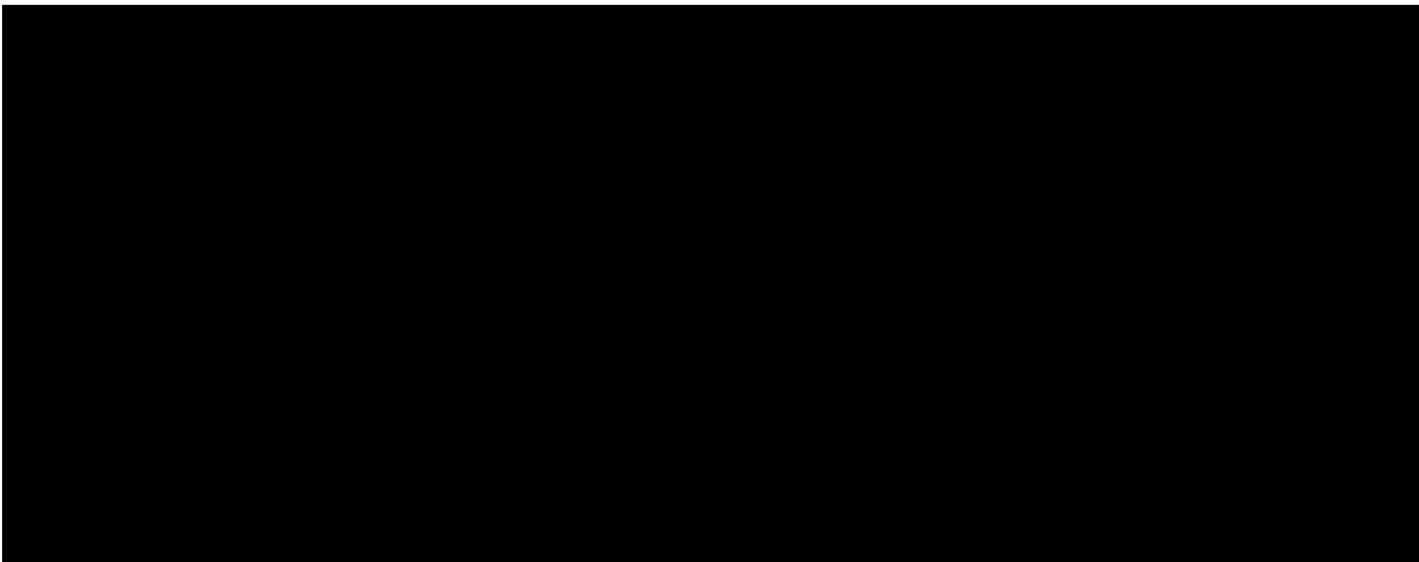
PROBLEMS OF ANALYSIS OF SOVIET GRAVIMETRIC SOURCE MATERIAL

In view of the importance of gravimetric observations and investigations carried out in the U.S.S.R., an attempt has been made to collect and systematize available information on this subject. This information came to our knowledge in a more or less casual fashion while gathering information for geodetic and astronomic control of the U.S.S.R. Because of the close connection between geodesy and gravimetry in the U.S.S.R., it has been necessary to examine all gravimetric data emanating from the U.S.S.R. The data themselves were of no direct value to the work on which we are actually engaged, but because of the desirability of a systematic study of gravity in the U.S.S.R. we considered it important to record the results of our search.

The accompanying contains 408 items and represents material which was
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Any group facing the problem of obtaining the most reliable and the most up-to-date information on Russian and Soviet gravimetry, is faced with formidable difficulties which may be summarized as follows:

(a) The subject of gravimetry, because of its close connection with geodesy, is considered by the Soviets to be of a defense nature and all precautions are taken not to allow actual data on gravimetric measures to leave the country. The actual number of pendulum observations reduced to one system (so far as we know, it is still Potsdam) is given in sources of 1952 (228) as being over 18,000 in number. The whole program, initiated in 1932, was set up to get at least one pendulum observation per 1,000 sq. klm.; that is, something like a total of 23,000 observations. The results of individual expeditions, published freely before 1935, have not been published since then in open literature. In source 227, for instance, the positions of places (often drifting vessels and floes) in the Arctic where gravimetric observations were made are given but not the measures themselves.

From time to time, the Soviets issue definite catalogues of gravimetric measures, of which one (G24) containing 532 determinations, is largely obsolete. Another catalogue, (K46) contains a total of 2,716 observations up to the year 1933. Neither of these catalogues was originally available in

the U.S.A., but were found elsewhere and are now in hand. There is still another catalogue published in 1945, which is reported to contain about 10,000 gravity determinations but which is not available at the present time.

The best, or at least the most complete, source of information at the present time at our disposal is a catalogue by Zhuravlev (Z30). This is not an official catalogue and is, in fact, only an appendix to his essay on the shape of the earth. It contains 10,712 measures of gravity determined over the whole surface of the earth up to 1937. About 7,000 of these measures fall in the territorial limits of the U.S.S.R.

A comparison of Z30 with K46 at once gives rise to misgivings. Besides very frequent misprints and poor typography in general (on page 86, for instance, the right half of the entries were moved up one line in reference to the left half; the printing was done during the war), the two catalogues often show differences in the value of observed g , amounting to two or three milligals. General agreement between the two catalogues is, of course, to be expected since K46 was supposed to have been incorporated in Z30.

(b) In view of frequent mistakes and misprints in Soviet catalogues, it is desirable to verify catalog entries from original sources when possible. These refer mostly to the time before 1935, but they have additional advantage of giving the location much more precisely than that given in the catalogues and detailed description of procedure. Here we meet considerable difficulty, since practically every source gives values of observed g quite differently from that of the catalogues. This difference is usually of a systematic character but its amount often varies very widely. A few such examples are repeated here:

<u>Source</u>	<u>Z30 - Source Difference in g</u>	<u>Remarks</u>	<u>No. of deter- minations</u>	<u>Year</u>
N33	+ 5 milligals	Constant	14	1928
A17	- 20	From -5 to -29	22	1928
B13	- 14	From -11 to -18	84	1932
V2	- 12	From -10 to -18	50	1933
Y9	- 14	From -10 to -22	84	1948

The last item deserves a special attention. It gives Δg (free-air) rather than g with a statement that it was derived from the new catalogue of gravimetric data (published in 1945).

It is therefore evident that the values of g or Δg given in source Z30 should be treated with considerable caution, a comparison with other sources should be made (this can be done with about 3,000 determinations), and the causes of discrepancy adequately explained.

In more recent sources gravity values (or Δg) are sometimes given to illustrate some point of theory. Such data are often based on the most recent (and presumably more reliable) determinations. (See, for instance, source G39 of 1952). From such sources some 400 gravity data can be collected which are not included in source Z30.

(c) Another source of information concerning the gravity field of the U.S.S.R. are gravimetric maps and profiles often printed in more recent publications. These are indicated in Part II if they are to be found in the original paper. Some of these maps give not only iso-anomaly curves but also the values of anomalies for points of observation not to be found in the available catalogues. Such for instance is source M45 of 1948. Over

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200 such maps and profiles have been found, generally covering the area south and west of the line Leningrad-Moscow-Irkutsk. This material, if critically examined and reduced to one system and one kind of anomaly, should give a fairly accurate gravity map of the region indicated but the amount of work involved will be very substantial.

Finally, in view of complete lack of gravity data for the northeast section of Siberia, the appearance of source Z28 of 1952 should be especially welcome. This source gives the average free-air anomalies for sectors of 100 square degrees each in the whole world including Siberia. At least some idea of the gravity field in that region can be obtained.

It should be clear that the treatment of gravity data in the U.S.S.R. involves much preliminary work and careful consideration of the problem. An investigator taking Soviet catalogues at their face value is likely to start his investigation with incorrect data, and no matter how good his mathematical technique may be, the result will be incorrect. It is hoped that this bibliography will facilitate the use of Soviet gravity data.

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p. 343 Profile Kamyshbosh-Cava (Fergana Valley)
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Area covered: $48^{\circ} - 51^{\circ}30'N$; $22^{\circ} - 26^{\circ}E$.
Valuable references to recent work in this region.
Three anomaly profiles.

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Three gravity maps: (1) East of the lake El'ton $49^{\circ}05'$ - $49^{\circ}20'$ N; $46^{\circ}40'$ - $47^{\circ}10'$ E; contour interval 5 mlg. (2) Lake Baskunchuk $47^{\circ}07'$ - 48° N; $46^{\circ}45'$ - 47° ; contour interval 2 mlg. (3) General map, contour interval 10 mlg.

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English abstract.
Gravity measures for 84 points, in the area of 25,000 square kilometers in the region Dossor River Emba-Uil

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Examples in text:
p. 322: Tsioris-Tskhali $41^{\circ}37'6$ N, $49^{\circ}59'6$ E, h 267 met.
g = 980.142. Isostatic reduction of this point. This is Z7954
p. 329: 6 groups of 71 stations in Caucasus, various corrections.
p. 337: Gravity anomalies in Baku region 38° - 42° N, 47° - 50° E.
given on map 1:100,000. Description p. 351. Contour intervals
25 mlg.
p. 336: Gravity anomalies in Moscow region $54^{\circ}50'$ - $57^{\circ}10'$ N, 36° - 39° E.
given on map. Description on p. 351.

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Detailed investigation of 41 gravity points determined in 1939. General discussion of the status of the problem and of previous determinations.

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Gravimetric Lab. of Geofiz. Inst., Moscow, 3 Pyzhevskiy Pereulok
the base of many recent determinations of gravity.
N.N. Pariyskiy determined for the gosudarstvenny Astronomicheskiy Institut
im. Shternberga in 1935 $g = 981.559.1 \pm 0.74$
 g (Gos. Astr. Inst. Sht.-Geof. Inst.) = -12.3 ± 0.14
Geofiz. Inst. $g = 981.546.8 \pm 0.75$
Details of determination, by Bulanzhe and Ryleyeva.

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Expedition of the Geophysical Institute to Garm area in 1945.
Obi-Garm seismological station of Tadzhik Filial of Ak. N.
38°42'7, 69°42'3, h 1333 met.
Obi-Garm-Moscow (Geof. Inst.) $g = -2.010.6 \pm 0.000.4$
For Obi-Garm $g = 979.536.3 \pm 0.000.78$

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Pulkovo - Inst. of Met. $g = +31.4 \pm 0.18$ mg.
For the institute $g = 981.930.8 \pm 0.00058$

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Introduction pp. 9-69 gives the current methods and point of view adopted in the USSR.

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On the influence of temperature gradient on the determination of gravity by free pendulums.
Sbornik NTPS, Vyp. 16, 1948, pp. 9-22
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Discussion of errors obtained with various instruments. 8 determinations of *g* for 4 places in Eastern Siberia are given (1936-43). Adopted *g*:

Yakutsk	982.047	Isit'	981.927
Ust'Kut	981.513	Oleksinsk	981.881

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